AFFAIRS

1 OCTOBER 1979 (FOUO 11/79) 1 OF 1

JPRS L/8693

1 October 1979

USSR Report

INDUSTRIAL AFFAIRS

(FOUO 11/79)

FBIS FOREIGN BROADCAST INFORMATION SERVICE

NOTE

JPRS publications contain information primarily from foreign newspapers, periodicals and books, but also from news agency transmissions and broadcasts. Materials from foreign-language sources are translated; those from English-language sources are transcribed or reprinted, with the original phrasing and other characteristics retained.

Headlines, editorial reports, and material enclosed in brackets [] are supplied by JPRS. Processing indicators such as [Text] or [Excerpt] in the first line of each item, or following the last line of a brief, indicate how the original information was processed. Where no processing indicator is given, the information was summarized or extracted.

Unfamiliar names rendered phonetically or transliterated are enclosed in parentheses. Words or names preceded by a question mark and enclosed in parentheses were not clear in the original but have been supplied as appropriate in context. Other unattributed parenthetical notes within the body of an item originate with the source. Times within items are as given by source.

The contents of this publication in no way represent the policies, views or attitudes of the U.S. Government.

For further information on report content call (703) 351-2938 (economic); 3468 (political, sociological, military); 2726 (life sciences); 2725 (physical sciences).

APPROVED FOR RELEASE: 2007/02/08: CIA-RDP82-00850R000100100002-7

JPRS L/8693

1 October 1979

USSR REPORT

INDUSTRIAL AFFAIRS

(FOUO 11/79)

CONTENTS

CHEMICAL INDUSTRY AND RELATED EQUIPMENT

STATISTICS FOR 1978 CHEMICAL INDUSTRY GIVEN

Moscow KHIMICHESKAYA PROMYSHLENNOST' in Russian No 6, 1979 pp 59-60

/Article by A. G. Cherednik: "Results of the All-Union Socialist Competition in the Fourth Quarter and Second Half of 1978 in the Chemical Industry"/

/Excerpts/ The meeting of the board of the Ministry of Chemical Industry and of the Presidium of the Central Committee of the Trade Union of Workers in the Chemical and Petrochemical Industry, at which the results of the all-Union competition in the fourth quarter and second half of 1978 were examined, was held on 18 January 1978.

The board of the Ministry of Chemical Industry and of the Presidium of the Trade Union Committee noted that, as a result of the industrial activity of the sector's enterprises and organizations, in 1978, as compared with 1977, the volume of sales of output increased by 4.7 percent, labor productivity, by 3.4 percent and profit, by 6 percent. The proportion of the increase in the production volume as a result of labor productivity growth comprised 72.3 percent with a plan of 66.7 percent.

As compared with 1977, the expenditures per ruble of commodity output were lowered by 0.3 percent. A total of 107,000 tons of nitrogen fertilizers and 378,000 tons of phosphorite meal and other products were produced in excess of the plan.

However, in connection with some objective reasons, which created certain difficulties in the work of enterprises in 1978, as well as the unsatisfactory work of some of the sector's enterprises, the Ministry of Chemical Industry did not fulfill the plan for a number of technical and economic indicators.

The 1978 plan for the sales of output was fulfilled 99.7 percent. Products worth 72 million rubles less than planned were delivered. They included 3.5 million tons of mineral fertilizers, 34,700 tons of plastics and synthetic resins, 103,000 tons of caustic soda, 12,200 tons of chemical fibers and goods for cultural and domestic purposes and household use worth 19.3 million rubles. The plan for the production of calcium carbide, soft cable compound, sulphonol, phenol-formaldehyde molding powders, ammonia, cellulose acetates, synthetic detergents and plastic articles was not fulfilled.

The profit plan was fulfilled 98.6 percent. A total of 68 million rubles less than planned were obtained.

The Balakovo, Uvarovo and Cherepovets chemical plants, the Berezniki Nitrogen Fertilizer Plant and some other enterprises of the sector continued to operate poorly.

The assignment of the third year of the five-year plan for the production of individual types of products and for a number of key technical and economic indices was not fulfilled in the Ministry of Chemical Industry as a whole.

Despite the unsatisfactory results of the sector's activity in 1978, on the whole, a number of subsectors and many enterprises successfully fulfilled state plans and socialist obligations.

The workers of the Beloruskaliy Production Association fulfilled the obligations for above-plan output adopted for 1973 ahead of schedule. In addition, the country obtained 194,000 tons of potassium fertilizers. The personnel of the Kazan' Organicheskiy Sintez Production Association fulfilled their obligations for the output of products with the Badge of Quality adopted for the five-year plan.

The personnel of the Volzhsk Organic Synthesis Plant, Slavgorod and Gomel' chemical plants, Primor'ye Bor Production Assocation, Monokristallreaktiv Scientific Production Association and so forth also made significant labor advances in 1978.

In 1978 efficiently operating enterprises sold output worth about 200 million rubles in excess of the plan and produced 1,591,000 tons of mineral fertilizers, including 727,000 tons of nitrogen fertilizers, 297,000 tons of phosphorus fertilizers, 208,000 tons of potassium fertilizers, 232,000 tons of sulfuric acid, 145,000 tons of ammonia, 7,800 tons of chemical plant protection agents, 39,000 tons of plastics and synthetic resins, 8,800 tons of chemical fibers and goods for cultural and domestic purposes and household use worth 24 million rubles.

11,439
CSO: 1821

CHEMICAL INDUSTRY AND RELATED EQUIPMENT

ACHIEVEMENTS OF CHERNIGOV CHEMICAL FIBER ASSOCIATION DISCUSSED

Moscow KHIMICHESKIYE VOLOKNA in Russian No 3, 1979 pp 1-2

/Article by G. A. Ivanova: "Achievements of Advanced Collectives--Into Wide Masses of the Sector's Workers"/

/Excerpts/ The Chernigov Khimvolokno Production Association is one of the best enterprises of the chemical fiber industry. For the high labor indicators attained in 1978 and the successful fulfillment of the assignments of the Tenth Five-Year Plan the association personnel was awarded the challenge Red Banner of Labor of the CPSU Central Committee, the USSR Council of Ministers, the All-Union Central Trade Union Council and the Central Committee of the Komsomol.

During 3 years of the five-year plan the association personnel overfulfilled the plan for the volume of sold output by 13.7 million rubles, for gross output, by 14.5 million rubles, for the output of chemical fibers, by 6,100 tons and for the output of products with the state Badge of Quality, by 47.1 million rubles. The entire increase in output was obtained as a result of a rise in labor productivity. Economic benefit of 1.8 million rubles was obtained from the introduction of new equipment and improvement in production techniques and 1.1 million rubles, from the implementation of measures for scientific labor organization. At the same time, more than 550 people were disengaged conditionally.

In the association special attention is paid to an economical expenditure of raw materials, supplies and electric and thermal energy. During 3 years of the five-year plan 1,270 tons of raw materials, 10.8 million kWh of electric power and 36,800 Gcal of thermal energy for the total amount of 1.4 million rubles were saved.

In 1978 the association personnel sold output worth 1.6 million rubles in excess of the plan, exceeded the planned output of chemical fibers by 800 tons, of cord fabric, by 600,000 m^2 and of consumer goods, by 200,000 rubles and obtained more than 670,000 rubles of above-plan profit. As a result of the daily fight for savings and thrift, 336 tons of basic raw materials, 3.45 million kWh of electric power and 11,100 Gcal of thermal energy worth 313,000 rubles were saved.

Entering the fourth year of the five-year plan, the personnel of the Chernigov Khimvolokno Production Association adopted the following socialist obligations: In 1979 to produce output worth 600,000 rubles in excess of the plan, including 400 tons of chemical fibers, to lower production costs by 100,000 rubles and to increase the volume of output with the Badge of Quality to 31 percent. The association personnel are confident that the adopted obligations will be fulfilled successfully.

11,439
CSO: 1821

CHEMICAL INDUSTRY AND RELATED EQUIPMENT

USSR TIRE INDUSTRY IN 4TH YEAR OF FIVE-YEAR PLAN

Moscow KAUCHUK I REZINA in Russian No 6, 1979 pp 3-5

[Article by A. N. Zherebtsov, head, VPO Soyuzshina, USSR Ministry of Petroleum Refining and the Petrochemical Industry]

[Excerpt] By translating the historical decisions of the 25th CPSU Congress and of subsequent Plena of the CPSU Central Committee to reality, workers of the tire industry unfurled socialist competition for increased efficiency and quality of work and successful fulfillment of planned quotas and, in three years of the 10th Five-Year Plan manufactured 45.7 percent more tires than in the corresponding period of the 9th Five-Year Plan, including double the number of light-vehicle tires. A great deal of work was done at all plants to increase production volume of new, improved tire designs with advanced rubber formulas. As a result the output of automobile tires with increased road wear (type R) was 18.3 percent of the total production quantity in 1978 versus 12 percent in 1975. The portion of higher quality goods was 50.6 in 1978 versus 39 percent in 1975.

Enhancement of tire quality was greatly facilitated by the introduction of a comprehensive system of product quality control at subsector enterprises, especially at the Dnepropetrovsk, Kirov and Leningrad tire plants as well as at the pilot plant of the Scientific Research Design and Testing Institute of the Tire Industry. Introduction of this system should be completed in 1979 at all subsector enterprises.

The growth rate of tire output in 1978 in 1978 was held back significantly because of delayed start-up and assimilation of new capacities in the associations Bobruyskshina and Nizhnekamskshina. The Moscow, Krasnoyarsk and Leningrad tire plants also did not meet the 1978 tire output quotas. The measures and assistance rendered to these plants in the latter half of 1978 enabled them to significantly improve work and meet the quotas of the third and fourth quarters of the year in all indicators.

In 1978, at most enterprises of the subsector, intensive capital construction continued. Basic efforts were directed at accelerating start-up of new capacities for tire production in the manufacturing associations Bobruyskshina, Nizhnekamskshina and at the Chimkent Rubber and Asbestos Combine. Significant work in expansion and reconstruction of production was done at the Omsk and Yerevan tire plants, enabling them to improve efficiency of capital investments.

In conformity with the plan approved in 1979, tire industry product output should increase 5.4 percent above 1978's level, including a 5.1 percent increase in tire production for cargo vehicles and agricultural machinery. This rise in tire output should be guaranteed because of the start-up and accelerated assimilation of new capacities in the manufacturing associations Nizhnekamskshina and Bobruyskshina, at the Omsk and Yerevan tire plants; and as a result of steps taken to improve use of capacities at the Barnaul', Moscow and Sverdlovsk tire plants. In addition, further enhancement of production efficiency is required.

We know that a basic indicator of production efficiency in the tire industry is the level of road wear of automobile tires. In 1979, the output of tires with increased road wear (type R) will be 26 percent higher than in 1978; higher quality tire output will rise to 28,800,000 units.

Because of the total introduction at the enterprise level of comprehensive product quality control, it is necessary to achieve further reduction in losses from defects, nonproductive expenditures and because of better use of raw material resources, energy and work time, increased quality of work at all levels.

A great contribution to the development of the tire industry has been made by the teams of the Scientific Research Institute of the Tire Industry, the Scientific Research Design and Testing Institute of the Tire Industry, Rezinoproyekt, their branches and pilot plants. In close cooperation with enterprise personnel, they should work even harder to achieve enhanced efficiency and quality of work at enterprises, accelerated rates of scientific and technical progress in the sector in order to achieve great end results.

In 1979 a lot of work in the area of capital construction and assimilation of new capacities will be done. Construction of the tire plant at the Chimkent Rubber and Asbestos Combine will continue. Tire output capacities must be started up in the fourth quarter of this year.

Among the primary tasks of the manufacturing association Bobruyskshina are the following:

- assimilation of high-capacity rubber mixing equipment and transportation systems;

- completion of expansion and reconstruction work of tire production sections for tractors K-701, K-700A and grain-harvesting combines;

- assimilation of tire production capacities for heavy-cargo tractor trailers and tires for the MTZ-80 and MTZ-82 tractors;

- organization of manufacture of light steel-belted radial tires.

In the manufacturing association Nizhnekamskshina it is necessary to assimilate newly started tire production capacities, output of 1065 x 420-457 tires for heavy-cargo tractor trailers and 14.00-20 tires for the Ural automobile; as well as guarantee the increased capacity for tire production for the t-150K, MTZ-80 and MTZ-82 tractors.

At the Barnaul' tire plant, a manufacturing section should be established for the 530-610 tires for grain-harvesting combines and the output of these tires should be begun in the fourth quarter of this year.

At the Dnepropetrovsk tire plant, start-up is imminent for production of large-dimension tires. Expanded production is foreseen at other tire plants.

Considering the shortfalls of past years, it is necessary to carefully focus on capital construction in order that the rates of construction work be raised at quickly as possible.

...tire workers promised to produce 230,000 tires above quota in 1979; to realize 15,000,000 rubles worth of additional products; and to produce 3,000,000 rubles profit above the assigned level.

8617
CSO: 1821

CHEMICAL INDUSTRY AND RELATED EQUIPMENT

UDC 662.74.003.1

PROBLEMS OF USSR BY-PRODUCT COKE INDUSTRY

Moscow KOKS I KHIMIYA in Russian No 6, 1979 pp 46-48

[Article by A. N. Silka, A. N. Minasov, M. V. Borodin and B. V. Ivanov, Giprokoks]

[Text] The USSR by-product coke industry occupies the global forefront in the production of coke, coke gas and chemical products; in the degree of enrichment, level of mechanization and automation of production. About 80 percent of the total amount of coke is produced in our country at enterprises having an annual capacity of over 3,000,000 tons of bulk coke. Development of the sector has been implemented in close cooperation with the technical level and advancement of ferrous metallurgy--the primary consumer of coke.

In recent years, the volumetric growth rate of coke production has declined somewhat because of a drop in the relative coke per ton of pig iron--in the past 20 years this has been cut to ten-seventeenths of its previous level. In spite of this, development of the by-product coke industry shows a systematic improvement of the primary technical and economic indicators. As a result of the rise in technical level of adoption of several technical organizational steps in recent years, the increase in production of techical-grade products in the sector has been guaranteed without increasing the size of industrial and production staffing. In the 9th Five-Year Plan alone, where by-product coke production rose 16 percent, there was a decrease in sector personnel of 2,700,000 workers. Per-ruble expenditures for the technical-grade product fell 0.7 percent in a five-year period. Profit from technical-grade coke in 1975, for example, was 27.8 percent higher than in 1970.

In addition, the economic development of the by-product coke industry has lately felt the negative impact of a number of factors, chiefly a deterioration in the quality of coals used in coking and the drop in the relative percentage of well-caking coals. Furthermore, there has been a systematic rise in the ash content of run-of-mine coals arriving at coal-enrichment factories of by-product coke industry enterprises and the output of concentrate has fallen.

Implementation of a set of steps to improve enrichment, preparaion and coal-coking technology requires significant capital investments and operating expenditures because of the drop in quality.

In the cost structure for production of technical-grade coke, the preparation cost of coal for coking has risen from 87 to 92 percent (sector average) in the last decade.

Improvement of coal preparation and coking technology plans, despite deterioration in the coal resource base, has maintained and even slightly improved coke quality (cf. table).

Indicators	Years				
	1940	1950	1960	1970	1978
Quality of coarse coal (sector average), %:					
moisture content....	4.93	3.23	3.16	3.15	3.27
ash content.....	10.89	10.73	10.62	10.60	10.60
sulfur content.....	1.42	1.28	1.24	1.14	1.07
Mechanical strength, %:					
M40.....	--	--	--	75.3	73.6
M25.....	--	--	--	--	87.1
Content in coke of class less than 25 mm,%:	--	--	2.62	2.81	2.73

In the by-product coke industry, because of construction of new enterprises and expansion of operating ones, basic industrial assets in the past two decades alone were 3.1 times greater (in values of corresponding years). Despite this, the average growth of operating coke furnace batteries increased by 71 percent in the past decade. Exploitation of old, exhausted coke furnace batteries leads to a signifiant rise in operating costs, reduction of coke quality and deterioration of labor conditions for maintenance personnel.

At by-product coke enterprises, a large set of steps has been taken to protect the environment against industrial wastes and to improve labor conditions--this requires additional capital expenditures and operation expenditures.

In the by-product coke industry, a large relative proportion (about 40 percent) of workers are employed in auxiliary shops.

Among those factors exerting an unfavorable effect on the economic indicators of the by-product coke industry we should include the incomparable cost of active assets and capital investments in construction of new, expansion and reconstruction of operating by-produce coke facilities.

This all goes to prove the need for a thorough, deep analysis of sector economics and the quest for real means to enhance efficiency. In this respect, there is exceedingly important meaning in the choice of optimum directions for further sector development. In the near and more distant future, questions of expansion, reconstruction and technical re-armament of operating by-product coke enterprises will become more and more vital. Calculations show that realization of

this expansion of operating by-product coke enterprises in the 10th Five-Year Plan will guarantee savings of some 168,000,000 rubles as compared to new construction and over 20,000,000 rubles of operating costs. Because of the growth of coke production at operating by-product coke enterprises during their reconstruction, savings of 46,000,000 rubles of capital investments and 5,500,000 rubles of operating costs will be derived.

All by-product coke facilities will be built to adapt to major trends of technological progress: introduction of new methods of blend preparation; enlarged capacity of technological plants and equipment; intensification of industrial processes using new refractory materials in construction of coke furnace batteries; further construction of facilities for dry coke quenching and improvement of this process; implementation of a set of measures to improve variety and quality of by-product coke products; maximum mechanization and automation of industrial processes; improvement of technical hardware and creation of new equipment, guaranteed improvement of labor sanitation and hygiene, effective purification of effluent water and gas and disposal of industrial wastes.

In selecting a raw materials resources base to expand and reconstruct by-product coke enterprises, particular attention should be given to the reduction of preparation costs of coals by increasing the share of Kuznetsk coals in blends at Ural and Central plants, by reducing further shipments of unenriched Karaganda and Pechora coals; by maximum possible reliance upon the least expensive poorly-caking and other coals. Raw material resource bases should have an economic justification in comparison with the attained results of the enterprise.

To improve coke quality and raise production efficiency, it is necessary to elevate requirements to the coal for in quality of coals supplied by coking. Furthermore, it is necessary to develop and introduce some new technical answers aimed at saving well-caking coals.

One of the important new technical trends is the use of a heat-treated blend for coking. According to existing preliminary data, this provides an opportunity for increasing participation in the blend of gas coals up to 50 percent and raises productivity of coke furnace batteries by 35-40 percent. For a more thorough study of ths process and its industrial introduction, construction and assimilation of the first industrial facility at the Western Siberia Metallurgy Plant must be pushed.

Great practical interest is offered by the development and introduction of a coking process at by-product coke enterprises, especially briquetted blends with weak-caking components. To study this process, industrial test facilities should first be built at one of the by-product coke enterprises in the South. For by-product coke enterprises in the East, which operate on Kuzbass coals, the method of selective crushing of blends using pneumomechanical separation is also effective.

With the deterioration of raw material coal resources, the question of wide industrial introduction of dry coke quenching facilities is of exceptional vital meaning. As we know, the use of these facilities, in addition to the utilization of incandescent coke heat, greatly improves the quality of coke, especially from blends containing up to 50 percent gas goals. In addition to raising economic effectivness, this process eliminates harmful industrial wastes occurring in wet quenching which pollute the atmosphere and cause corrosion of equipment and structures, and improves labor conditions.

A major technical trend for further raising production efficiency is to increase the capacity of by-product coke furnace batteries and enlarge technological flow-lines in construction of new enterprises and expansion of operating ones.

Operation of coke furnace batteries with 41.6 cubic meter furnace chambers confirms the feasibility of their enlargement to 50-55 cubic meters. The rise in unit capacity of coke furnace batteries will double labor productivity in coke shops and reduce specific capital investments and operating costs by 7-10 percent.

In reconstructing existing enterprises, it is most effective to use advanced construction of coke furnace batteries of large capacity instead of old, worn ones, which significantly reduces coke production losses at existing coke furnace batteries.

These trends do not exhaust all the possibilities for further improvement of the layer method of coking, and show that there are considerable reserves for a further improvement of efficient by-produce coke production.

Special attention should be given to the introduction of formed metallurgical coke production. Assimilation of this new process will expand the raw materials base of coking because of reliance in the boking blend upon gas and poorly-caking coals; will raise quality of coke; will improve labor conditions of maintenance crews in the by-product coke industry; will reduce labor intensiveness in the coal industry in connection with mining of non-critical coals (lower shaft depth, open-pit coal mining, etc.)

To speed up the assimilation and broad industrial introduction of the formed coke method of production, two industrial facilities must be built in the coming years. In addition to the head facility ear-marked for construction at the Altay By-Product Coke Plant, a 1.5-2.0 million ton/year industrial facility must be built at an enterprise in the South. Successful industrial assimilation of formed coke production will permit construction of these facilities at operating by-produce coke enterprises during reconstruction and technical re-armament instead of the old coke furnace batteries.

In order to raise efficiency of production, demand of expensive metallurgical coke for production of ferrous alloys, fire-resistant materials, iron ore agglomerates and non-ferrous metal ores, production of yellow phosphorus, rock wool, etc. must be completely cut off in the current five-year plan. This requires the scientific research and planning institute of ferrous metallurgy, non-ferrous metallurgy, chemical industry and othe sectors needing coke, together

with scientific research institutes of the coal industry, to seek practical answers for maximum replacement of metallurgical coke by poor coals and other kinds of solid fuel. In addition, production should be organized for special kinds of coke fo these consumers (enabling possible replacement of coke). Production of non-metallurgical coke should be guaranteed not only at the Gubakhinskiy, Kemerovskiy and Moscow plants, but also at other by-product coke enterprises of the East and south of the USSR.

Since over 4,000,000 tons per year of blast-furnace coke is consumed for the above needs, replacement of this coke by non-blast furnace coke (which can be produced from cheaper coal) and by cheaper forms of fuel, may yield for the national economy a significant economic effect. The answer to this problem should be coordinated with the determination of the optimum size of blast-furnace coke.

Analysis of several questions defining the economics of the sector alone shows that the by-product coke industry has great reserves for further enhancement of efficiency. In order to successfully solve problems posed by the 25th CPSU Congress, existing reserves must be used completely.

8617
CSO: 1821

CONSTRUCTION, CONSTRUCTION MACHINERY, AND BUILDING MATERIALS

WAYS TO IMPROVE HOUSING SERVICES EFFECTIVENESS ANALYZED

Moscow VOPROSY EKONOMIKI in Russian No 7, Jul 79 pp 94-101

[Article by B. Kolotilkin: "The Effectiveness of Housing Services"]

[Text] The development and preservation of the state and social housing inventory are among the prerequisites to insuring to USSR citizens the right to housing that was established by the new USSR Constitution.

During the 6 postwar five-year plans and the first 3 years of the Tenth Five-Year Plan, almost 300 billion rubles were invested in housing construction, which is about 17 percent of all capital investment during this period. As a result, 2,693,400,000 m^2 of total (useful) space, or 56.2 million apartments, were introduced; 63 percent of the housing was built in the city, 37 percent in the countryside.

The program of social transformations and the rise in the people's material and cultural standards of living planned by the 25th CPSU Congress call for further improvement in workers' housing conditions. The Main Directions for Developing the USSR's Economy During 1976-1980 recognized the need to build 545-500 million m^2 of total housing space, to raise the quality of housing construction and to improve the operation and preservation of the housing inventory.

On 1 January 1978 the housing inventory of cities and workers' settlements consisted of 2,001 million m^2 of total space, including 1,510 million m^2 of the collectivized housing inventory. The value of the fixed capital of the USSR's housing services on 1 January 1978 was 20.5 percent of the value of the whole fixed productive and nonproductive capital of the national economy. The total area of the urban housing inventory on 1 January 1979 had risen to 2,068 million m^2.

Qualitative changes have occurred in housing construction in the past 15 years: apartments were built mainly for 1-family occupancy (90-95 percent), areas of subsidiary premises were enlarged, the layout and sound insulation of apartments were improved, the number of 3- and 4-room apartments rose, and so on. The number of stories of apartment-house buildings and the number of buildings equipped with elevators and trash chutes increased.

According to estimates, by 1980 the housing inventory of cities and workers' settlements will reach 2,190 thousand [sic] m^2 of total space, and 12.6 m^2 will be assigned per person, and in so doing, the territorial distribution of the housing inventory will be changed in accordance with the realization of plans to develop the country's productive forces (in Siberia and the northern regions). All this dictates a growing role for housing services as a socio-economic and engineering system, and a need to accelerate scientific and technical progress in this sector of the national economy, to strengthen its economic accountability and to raise its effectiveness.

Qualitative and regional shifts in new housing construction and other factors have led to a growth in expenditures for operating the housing services. The expenditures of local soviets, calculated according to USSR TsSU [Central Statistical Administration] definitions (not counting expenditures for overhaul), per m^2 of housing area operated, increased from 2.5 rubles in 1966 to 3.02 rubles in 1977.

The main categories of expenditures--for current repair of housing (44.6 percent) and for maintenance of servicing personnel and of the housing services (36.7 percent)--rose in the greatest amount during 1966-1977, by 67 and 25 percent, respectively. The indicated trend is a positive one, since it results primarily from insuring that housing buildings are kept in good working order and from maintaining sanitary and hygienic conditions in apartment houses and on the adjacent grounds.

The income of the housing services also increased during the past decade, along with a growth in expenditures. It rose from 2.51 rubles in 1966 to 3.04 rubles in 1977, or by 21 percent per m^2 of operated living space of the housing inventory of local soviets as a whole. The main category of income of the housing services was apartment rent, which was 55.1 percent, rental income for the use of nonresidential premises 18.5 percent, collections from tenants for operating needs 10.6 percent, and similar receipts 15.8 percent. Growth in the income of housing services after 1967 was caused by a rise in the rental payment for use of nonresidential premises and by reimbursement for expenditures for the upkeep of the networks of lines for water, heating and other utilities that are within the apartment houses, made by the enterprises that obtain income from the operation of these systems and installations.

It will be desirable later to perfect the rate of rental payments and collections to reflect more completely the housing organizations' expenditures for upkeep of the nonresidential premises as a function of their purpose and of the engineering and other requirements placed on them. Beginning with 1979 the whole rental payment for use of nonresidential premises will remain at the disposal of the housing organizations and will be spent by them to finance measures for the current repair and upkeep of the apartment houses.

The question of apartment rent remains unresolved. At present it is collected at a single rate per m^2 of living space, regardless of the area of

the subsidiary premises or the level of improvements and amenities of the apartment or the apartment house. One and the same payment is made for apartments that differ in quality and comfort, for old and modern apartments, for communal and one-family apartments with different composition and area of subsidiary premises, for apartments in buildings with elevators and trash chutes and for those without them, and so on. The lower the apartment rental rate per computed m^2 of total space, the higher the quality of the apartment and the apartment house. Such a situation has become a brake on the introduction of full economic accountability into housing services and does not meet the requirements of social development.

Earmarked collections that are intended for reimbursing the expenditures of the housing services for municipal services for apartment occupants and the renters of nonresidential premises are not counted in operating expenditures. The level of earmarked collections is high: during 1966-1977 deductions therefor rose in the case of the housing inventory of local soviets from 1.97 to 2.85 rubles per m^2 of living space operated, or by 44.7 percent.

The structure of earmarked collections for the local soviets' housing inventory throughout the USSR for 1977 was marked by the following data (expenditure in percent of the total): heating 41.0; water supply and sewer systems 20.0; cesspool cleaning 1.3; electricity 5.3; hot-water supply 15.9; and other earmarked collections 16.5 percent. The share of those who rented nonresidential premises was about 10 percent of the total of earmarked collections.

Growth in the absolute and relative levels of earmarked collections during 1966-1977, especially for hot water (68 percent), was connected mainly with a rise in the proportion of new housing with improvements and amenities in the total housing inventory. Also, the rise in fuel prices that was set in 1967 and more complete reimbursement by nonresidential-premises renters of the housing administration's expenditures for the operational upkeep of such premises was influential to a known extent.

A certain excess of income over expenditures as a whole for the housing inventory of local soviets is fairly conventional. There are also no few unprofitable housing services. Moreover, USSR TsSU reporting does not count subsidies and other sources of funds that are allocated to the overhaul and modernization of housing buildings (about 2.2 billion rubles during 1977). About 0.6 percent of the country's income, or 0.8 percent of that part of it that is directed toward consumption, is required annually to cover this subsidy.

The practice of diverting funds intended for housing overhaul to work to eliminate construction deficiencies and defects still has not been eliminated. For example, at least 5 million rubles from the fund intended for housing overhaul is diverted annually in Moscow to these purposes; this affects negatively the state of operating discipline in construction and reduces the material and moral responsibility of construction organization managers to observe quality in construction work.

The USSR Council of Ministers decree, "Measures for Further Improving Operation and Repair of the Housing Inventory," (1978) set a 2-year guarantee period (from the date of acceptance of apartment houses into operation) during which, upon the demand of housing-operating organizations, construction and construction-repair organizations are obligated to eliminate at their own expense omissions and defects for which they are at fault that have been observed during the operating process in apartments houses that they have built or overhauled (regardless of the type of work).

Annual expenditures for operating the housing inventory of local soviets, including earmarked collections and actual expenditures for overhaul, were 8.1 rubles per m^2 of living space (4.1 percent of the restoration cost of the housing) in 1977. Of that amount, 3.57 rubles (44.1 percent) went to expenditures for current repair and overhaul of housing and 2.95 rubles (36.4 percent) for earmarked collections. This means that about 80 percent of the annual expenditures on the housing inventory were involved in payment for the services of construction-repair and municipal-services (for heating and so on) production enterprises and organizations. A reduction in operating costs and in rates for these services is a main reserve for raising the effectiveness of housing services.

The excess of annual expenditures over income during 1977 is assessed at 2.21 rubles per m^2 of living space, which practically corresponds to the sum of the subsidy for apartment house overhaul (2.23 rubles). In this case, amortization deductions for renovation, as well as the occupants' expenditures for current housing repair (the latter is assessed roughly at 1 ruble per 1 m^2 of living space per year) are not considered in these expenditures. Thus, in 1977 the specific expenditures for current repair of the housing inventory (per 1 m^2 of living area) were about 2.35 rubles, which is higher than the specific expenditure for the overhaul of housing (2.23 rubles). The excess of expenditures for current repair of apartment houses in comparison with expenditures for overhaul will increase as the soundness of the housing and the extent to which they are equipped rises further. Growth in the effectiveness of functioning of the housing services has been associated with the need to put order into price-setting for the repair work and services that are extended to housing organizations by the various economic entities of cities.

The economical expenditure of thermal and electrical energy in housing operations is of great national economic importance. During the past 15 years specific heat consumption (per 1 m^2 of total space in newly erected housing buildings) rose by 45-50 percent. In so doing, more than half (33-35 percent) of that additional heat consumption was caused by a rise in the standard of housing (equipping housing with baths and hot-water supply systems) and more developed sculpturing of building facades (loggias and balconies), as well as (12-15 percent) by construction defects (low quality in the infilling of window and balcony openings), and so on. Specialists estimate that heat losses in apartment houses can be reduced by about that same 45-50 percent by improving design solutions for the architectural and constructional parts of the buildings (walls, windows and doors, warm attics, loggias, double storm porches, and others), providing the construction branch with effective thermal protectors and

sealing and packing material and articles, a rise in the quality of construction and installing operations, the introduction of systems for heating with automatic regulation of the heat supply, including facade regulation (temperature of the air in the premises), the introduction of metering of the hot water used by occupants, and other ways.

The live labor expenditures are great. While worker manning in industry in 1977 was 129 percent of the 1965 level, in housing and municipal services and amenity services it was 170 percent. Worker manning of the housing services of local soviets in 1977 reached 1.12 persons per 1,000 m^2 of living space served for the USSR as a whole, but a substantial fluctuation by Union republic was noted (0.82 in Uzbekistan and 1.26 in Moldavia), and this does not count moonlighters, the share of which was about 10 percent of the manning of housing services. The labor of 90 percent of housing-services workers (yardmen, janitors, trash collectors and current-repair workers) practically has not been mechanized. Mechanization of the tidying-up of sidewalks and grounds is being introduced especially slowly.

The continuously increasing shortness in staffing helps to increase the number of moonlighters among servicing personnel and current-repair workers, a fact which, unfortunately, is not reflected in existing reporting. A substantial increase in worker manning for housing services (by about 70,000 workers per year) is required for preservation of the currently existing technical and organizational level of support for housing services and for the amount of state and cooperative housing built annually.

Research that has been conducted on the functional distribution of repair and construction work and of qualitative changes in the housing inventory and other research testify to the desirability of refraining from an economically unjustified bent mainly toward overhauling housing. With an increase in the share of masonry buildings, in which wooden ceiling-floors and partitions practically are no longer used, in the cooperative housing inventory and expansion in the variety of equipment in use, current-repair work becomes paramount in volume and cost. It is therefore necessary, in our opinion, to increase the share of allocations for current repair so that the ratio of expenditures for current repair to overhaul will be about 1:1 within the currently existing overall level of housing organization expenditures for the repair of housing buildings. The trend of development that has been building up confirms this principle.

At present the overwhelming portion of current-repair work is being done by the forces and funds of the housing services themselves, by the so-called owner method. The labor productivity of workers engaged in current repair in housing services is one-half to two-fifths as great as in construction-repair organizations. Workers in housing administrations engaged in current repair are distributed as follows (in percent of the total): fitters for technical servicing--70 (60 of whom are sanitary-engineering fitters), and construction-specialty workers--30. Thus, the housing services are least of all engaged in current-repair work on constructional elements. In this area, the greatest amounts of work are connected with the current repair of roofs, the infilling of window and door openings, floors, and outer walls, including panel joints. Within the

structure of expenditures for current repair that is carried out by the owner method, 86-89 percent of the expenditures are for wages, only 11-14 percent for materials. Thus, the existing system for the technical servicing and current repair of housing buildings by the forces and funds of each housing services unit, which is based upon manual labor, has come into contradiction with the requirements for raising the social productivity of labor in the housing services.

The increase in the housing inventory is making the problem of improving the organization and management of the housing services and of raising their technical level extremely severe. This problem can be resolved by concentrating material, labor and other resources, mechanizing and automating production-operation processes, converting to single schemes of management, based upon the consolidation of housing and repair organizations, and improving the system for planning and economic incentives in the housing services.

The Ministry for Housing and Municipal Services of Georgia has developed, "Basic Principles for an Integrated System for Management of the Quality of the Republic's Housing Inventory." It reflected a complex of scientific, engineering, economic and organizational methods that will provide for sophistication and continuity in serving the people, the timely and defects-free conduct of repairs of apartment houses, and a rise in the permanency and effectiveness of the work of all elements of the activity.

The above-mentioned USSR Council of Ministers decree called for the creation, primarily in large cities and based upon existing housing-operations and construction-repair organizations of the ispolkoms of local soviets of people's deputies and on existing enterprises and organizations of ministries and agencies, of a single construction-repair service and a single housing-operations service, which, under agreed conditions, would provide for the technical servicing, current repair and overhaul of the state housing inventory (regardless of its agency subordination) and the inventory of housing-construction cooperatives.

The departmental fragmentation of the state housing inventory (almost 65 percent of the housing belongs to enterprises and organizations of various ministries and agencies) prevents effective development of the housing services to a great extent. The elimination of agency fragmentation of the housing services and the gradual transfer of apartment houses to the jurisdiction of local soviets would help in the implementation of a single policy in the area of technical servicing, repair and modernization of apartment houses, consolidation and specialization of the industrial-production and material base necessary for this purpose, the training of personnel, and so on, which, in our estimates, based upon reported data for 1977, would enable operating expenditures to be reduced nationwide by about 300 million rubles.

Where the pace of obsolescence of housing accelerates, solution of the basic methodological aspects of the problem of using and modernizing existing buildings is required. At present there is no single center to supervise design and surveying work in the area of overhauling and

modernizing buildings; this leads to a reduction in the quality and effectiveness of the work. The interval between actual dates for start of the work and the final preparation of the design and budget-estimating documentation for facilities to be overhauled and modernized is great. As a result, numerous instances are observed of the reexamination of budget-estimated costs of the work that increase those costs; this complicates planning and reduces the effectiveness of work performance in the overhaul and modernization of housing.

The successful realization of technical servicing, current repair, overhaul and modernization of apartment houses where there is a progressive reduction of specific expenditures for live and embodied labor depends greatly upon the supply of materials and equipment for the housing services, the development of industrial methods for performing the work, and the specialization of contracting organizations and the equipping thereof with modern equipment. The supply of materials, parts and articles that are used for the technical servicing, repair and modernization of housing buildings that differ in constructional systems, number of stories, engineering equipment and periods of operation, and, on the whole, the maintenance of balance in plans for the repair and modernization of housing and the provisioning of materials and equipment, remain among the severest problems of the housing services. In solving them, the fact that material resources are also required for current housing-premises repair done through the funds of apartment occupants should be considered.

The development of housing construction and the rapid increase in the housing inventory, the growth in the number of stories and the increased complexity of constructional structure, change in the qualitative characteristics of modern apartment houses that are equipped with complicated engineering equipment, and a multiple-tier organizational structure--all of these raise greatly the demands on operation of the housing inventory. Realizing these requirements is linked with the solution of engineering, organizational, economic and social questions. In this connection, it becomes necessary to train engineers, economists, technicians and skilled workers on a nationwide scale in the operation and repair of the housing inventory.

Solution of the huge tasks of raising the effectiveness and quality of work of housing services, which make up an independent sector of the national economy, with their pronounced social significance, is unthinkable without deep scientific study and experimental verification of ways of improving the organization and technical level of operation, repair and modernization of housing buildings. Scientific-research and design institutes should pay special attention to working out questions of the formulation and functioning of the housing inventory, primarily by determining the main directions for further improvement in the designs and operational characteristics of apartment-house buildings.

Theoretical and applied developments in technical servicing and repair of the housing inventory should rely upon the achievements of science. It is necessary to work out a scientifically substantiated period between

overhauls of apartment houses, norms for the periodicity of and standards for expenditures for technical servicing, current repair and overhaul, differentiated as a function of the design, number of stories, age and mix of equipment used in housing that is being operated under various natural and climatic conditions.

The task of optimizing the size of the housing services, which is connected with an evaluation of numerous chance factors--the different number of stories of apartment house buildings, their age and territorial scattering, the organization of current repair, and other conditions--still has not been resolved theoretically. This reduces the effectiveness and quality of functioning of the housing services.

The housing services cannot be managed effectively without sound information. The creation of an information service based upon modern computer equipment is a complicated matter, and it should be calculated not just for one year. An enormous volume of information (reports, directives, summaries, questionnaires, letters and so on) that are used in the adoption of decisions in housing services at various levels of administration (housing services, housing operations trusts, rayon and city housing administrations, and the ministry) must be sorted out and channels for this information established.

Information about the engineering status of the housing inventory should have a special place. In particular, in order to provide for uniformity of information about the safety of buildings, it is necessary to draw up a classifier of defects, damage and breakdowns of constructional members and the engineering-equipment systems of apartment houses of various types that have been registered and are being eliminated during the operating process. The development, experimental verification, introduction and setting up of a system for running classifiers should be designed for conversion to digital-computer language in the future.

In this connection, there is now a need to develop a scientifically substantiated terminology in the area of housing services that embraces the sphere of management, technical servicing and repair of housing buildings, and so forth, and that rests upon the systems of concepts that have been created and standardized among branches of the economy.

It is desirable to undertake development of the methodological aspects of the problem of evaluating the quality of the housing inventory and the development of a dynamic model of the interdependence of the construction of new housing and the functioning of existing housing as a scientific basis for forecasting and planning for the development of housing construction and the housing services.

It is time to pay attention to scientific development of the engineering and economic questions of mechanizing and automating operating processes in apartment buildings (mechanization of the washing of staircases and the cleaning of roofs, sidewalks and grounds of housing blocks, the creation of an apartment-housewide system for dust removal, the cleaning and

repairing of building facades, window washing in high rises, the hoisting of parts that are used for the repair of elevators, and so on). Experience in mechanizing the work of housing services operations indicates that it is highly effective. For example, the mechanized sweeping of sidewalks in the winter by means of machines that still have not been perfected costs less (about 30 percent), and the expenditure of workers' labor in so doing is reduced considerably (by as much as 50 percent).

Solution of the tasks of mechanizing and automating operating processes requires the creation of models of special equipment, the experimental verification thereof and the subsequent organization of large-scale production. All this should be considered in developing the architectural, constructional and sanitary-engineering portions of designs for apartment houses. The time has come when the development of basic principles for the repair of structure and the engineering-equipment systems that have been created and arrangements for the mechanized sweeping of grounds and streets should become component parts of design, including the selection of rational layouts for apartment-house blocks.

The severity of the problem of the sanitary cleaning of communities increases constantly. The specific volume of household waste will grow from 0.8 m^3 per person in 1975 to 1.5 m^3 in 1990. By 1980 the volume of household waste in Moscow will reach about 11 million m^3. This problem has not only social (hygienic and ecological) but also technical and economic aspects. The hygienic aspect of the problem consists in providing for the regular and timely removal of household waste from housing buildings and from yards and grounds. The ecological aspect of the problem consists in preventing pollution of the environment. The negative consequences of such pollution is associated with expropriation of suburban land for making dumps, with dumping trash there, and with contamination of the soil and the air basin (when burning polymers and other articles). The engineering aspect of the problem includes questions of integrated mechanization of the collection, loading and removal of household waste, the creation of special sweeping machines that are suitable for use in various climatic regions, and others.

The economics aspect of the problem is connected with an assessment of the expenditures to avoid losses from pollution of the environment (including capital and current expenditures for organizing mechanized collection, removal, utilization and processing or destruction of household waste), and also possible savings from the secondary use of the waste--the metal raw material acquired, recycling, pyrolysis and the use of waste heat, composting and obtaining valuable organic fertilizer, and so on.

Questions of the reliability and effectiveness of the engineering equipment of housing buildings, the share of which comes to 50 percent of all expenditures for engineering servicing and repair of buildings, are extremely urgent. Because of this, the level and structure of actual expenditures for the repair and servicing of the engineering-equipment systems of apartment buildings of various numbers of stories should be studied with a view to developing proposals for an economically desirable increase

in the operational characteristics of such systems, in their service lives, freedom from breakdowns, ease of repair, and so on.

Experience indicates an urgent need to review the approach to bulk indicators for housing and municipal services and to find effective forms for the use in planning and economic motivation of a system of indicators that characterize the economic effect and that enable the economic-accountability interests of both producer and customer to be considered.

In planning development of the housing and municipal activity, it is hardly desirable to stimulate high growth rates for sales of heat, electricity, gas and potable water. Such an approach induces wastefulness, since it engenders a striving to consume more resources at any price. The main indicators of quality and effectiveness in the functioning of housing services can be considered to be: optimal and uninterrupted satisfaction of the requirement of the housing services and of the apartment occupants themselves, which are uneven by season, day of the week and hour of the day for heat, electricity, potable water and gas, with the observance of the sanitary and hygienic norms and standards for quality of service and labor productivity; successful realization of the planned preventive maintenance system; provisioning for the uninterrupted operation of passenger and freight elevators; and timely sanitary cleaning of places of common use in housing buildings (staircases and trash chutes) and on the grounds of the housing property, without which it will not be possible to establish favorable conditions for the residence and recreation of the people. In planning, unjustified growth in profit, level of profitability and volume of sales of services by overstating the amounts and costs, and a reduction in the quality of housing-repair work must not be permitted. Such a source of profit cannot be used to form the material incentive funds of construction repair organizations, and it is subject to full withdrawal into the budget.

The principle of saving people's off-work time is a determining factor in evaluating the social effectiveness of the work of housing-operations organizations. In this connection, The Main Directions for Developing the USSR's National Economy During 1976-1980 that was adopted by the 25th CPSU Congress noted the necessity to bring urban planning into accord with master plans for city development, to improve amenities, services and architecture, to increase centralization of the hot-water supply, to expand the use of gas and of large heat-supply sources, to expand maintenance of the housing inventory, and to raise the state of preservation of the housing inventory.

11409
CSO: 1821

METALLURGY

UDC: 669.4/5:338.45

SECONDARY ENERGY RESOURCES — AN IMPORTANT RESERVE IN INCREASING THE EFFECTIVENESS OF THE LEAD-ZINC INDUSTRY OF KAZAKHSTAN

Moscow TSVETNYYE METALLY in Russian No 6, Jun 79, pp 3-4

[Article by U. S. Alimbetov in a special section on "Efficient Utilization of Resources"]

[Text] The "Basic Directions for Development of the Economy of the USSR for 1976-1980" set the following task before workers in power-related industries in our country: "...improve the structure of the fuel and energy balance. Improve the utilization of fuel, make more complete use of secondary fuel and energy resources..." [Materialy XXV s'yezda KPSS. (Materials of 25th CPSU Congress), Moscow, Politizdat Press, 1978, 255 pp.]

Particularly significant in the performance of this task is increasing utilization of secondary energy resources (SER) — the greatest reserve for fuel savings in the lead and zinc industry, in order to decrease the quantities of fuel and energy consumed in production. Efficient utilization of SER in the lead and zinc industry must be combined with the greatest possible intensification of primary production processes, and increases in operational reliability.

Great attention has been given to the assimilation of secondary energy resources. Recently, regenerative steam generators have been introduced: with rotary kiln No. 7 at the Ust'-Kamenogorsk Lead-Zinc Combine, with the fuming furnace at the Chimkent Lead Plant. A regenerative steam generating plant is now in operation at the Leninogorsk Polymetals Combine in the section where pyrite concentrates are roasted. Evaporative cooling systems are operating effectively in these enterprises.

As a result, over 60,000 tons of (standard) fuel were saved last year, by the use of SER.

In spite of the significant work which has been done by power-section workers at various enterprises to increase the effectiveness of utilization of fuel and energy resources in industry, significant reserves remain: the capabilities for increasing the output of SER have not been exhausted, and their use is not yet sufficiently efficient. Performance of these tasks will require the combined efforts of power-section workers and technologists, scientists and designers.

Analysis of the utilization of heat at lead and zinc plants has demonstrated significant losses of heat. The level of utilization of secondary energy resources at the Ust'-Kamenogorsk Lead and Zinc Combine, the Leninogorsk Polymetals Combine, and the Chimkent Lead Plant is still not over 28% of the possible yield of SER. This is explained in many cases by the lack of progressive designs for regeneration installations, and the low efficiency of existing ones. One reason for the low level of utilization of SER is that as the fuel needs of an enterprise are planned, SER are not taken into consideration as a genuine replacement for primary fuel. However, these resources can satisfy the needs of an enterprise for heating fuel.

For example, the initiator of the use of SER — the Ust'-Kamenogorsk Lead-Zinc Combine — has achieved significant success in the area of saving thermal energy, and plans to stop using steam from the Ust'-Kamenogorsk Heat and Electric Powerplant completely by 1980.

In the fluidized bed furnaces, the heat used to roast sulfide concentrates consists of two parts: the physical heat of the exhaust gases and the excess heat present in the fluidized bed.

The need to cool the gases is determined primarily by the need to assure reliable operation of regenerative steam generators paired with the fluidized bed furnaces and, secondly, to achieve the required gas temperature. This last requirement is particularly important, since wide fluctuations in gas temperature have a bad influence on subsequent technological processes, in which the gases are cleaned and utilized. As we know, electric filters are efficient only if the entry temperature of the gases they must filter is constant. It must be recalled that broad-scale industrial application of regenerative steam generators is effective only if their operational reliability is equal to that of the basic process equipment. The unsatisfactory operation of regenerative steam generators used in the Zinc-Concentrate Roasting Shop at the Leninogorsk Polymetals Combine has resulted from the fact that the design of these generators failed to consider the specific characteristics of the exhaust gases generated by nonferrous metallurgy furnaces, including: high contents of sulfur dioxide (8-15%); high dust content of the exhaust gases (0.3-0.4 kg/m^3); the low melting point of the solids present in the gas and their low sintering temperature (700-1,000 C); the finely dispersed, needle-like structure of the solid particles, resulting in the formation of compact sediment, even at low temperatures.

This problem has been successfully solved at "Ukrtsink" Plant, where a regenerative steam generator type TKS-4/40 has been installed in the Zinc-Concentrate Roasting Shop with a KS-3 fluidized-bed furnace. The steam generator was put in operation in September of 1971, and is now operating quite normally.

The experience of "Ukrtsink" Plant has shown that the use of a tunnel-type regenerative steam generator largely eliminates the difficulties related to cooling of roasting furnaces gases, and this type of generator is recommended for broader use.

We must also speed up the installation of evaporative cooling units on metallurgical plant equipment, utilizing the experience of the Ust'-Kamenogorsk Lead and Zinc Combine.

The effectiveness of the use of SER is not limited to the production of thermal energy. The utilization of heat can reduce capital and operating costs in metallurgical production. Cooling of gases without the introduction of atmospheric air does not require the consumption of electric power for exhaust fans, significantly decreases the cost of gas purification structures, and maintains the concentration of sulfur dioxide in the gases high, thus making the production of sulfuric acid from the gases more effective. The use of evaporative cooling of furnaces increases the service life of the cooled elements, decreases the consumption of process water and allows the production of a significant quantity of steam at relatively low cost.

The experience which has been gained in using existing regenerative steam generators confirms that the cost of the steam produced is lower than that of steam produced in ordinary steam generators, and even lower than cost of steam purchased from a heat and electric powerplant. The basic solution of the problem might be the creation and manufacture of a series of regenerative steam generators which could assure reliable operation of process equipment with a high degree of utilization of the heat of exhaust gases. The amortization of capital investments in new regenerative steam generators which operate satisfactorily usually takes 1 to 3 years, indicating the high effectiveness of capital investment in the use of SER.
[8144/1738-6508]

END